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# FOURDRINIÈR'S

# PATENT SAFETY APPARATUS

FOR PREVENTING

# ACCIDENTS IN MINES AND COLLIERIES.

BODLEIAN
27 APR 1929
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### TO THE

# PROPRIETORS OF COLLIERIES AND MINES

## IN THE UNITED KINGDOM.

My Lords and Gentlemen,

Having resided for some years in a colliery district in Staffordshire, I have become acquainted with the many melancholy and fatal accidents constantly occurring from the breakage of ropes or chains, and believing that some mechanical apparatus might be arranged to prevent this fearful loss of life and injury to property, I have now the satisfaction to assure you that, after much labour and expense, I have succeeded in producing an apparatus fully efficient for the object, and for which I have obtained patents. The advantages of the invention, you will, no doubt, allow are fully borne out by the certificates and testimonials annexed. To prove that some means are necessary for the protection of those who are obliged to descend pits, I herewith add an analysis of the causes of death of 415 persons, recorded in "The Mining Journal," from 1st January, 1848, to 31st December inclusive, but which only exhibits a very small portion of the mining districts, naming only nine counties in England, and not alluding to one accident in Scotland, I may, therefore, justly infer that had a more general return been made the numbers would have been most fearfully increased.

| Deaths. | By Explosion. | Breakage of Ropes or Chains. | Falling down Shafts. | Falling of Roofs. | Suffocation. | Tram Waggons. |
|---|---|---|---|---|---|---|
| Wales ........ | 43 | 22 | 6 | 39 | 5 | 1 |
| Lancashire .... | 24 | 10 | 13 | 9 | .. | 3 |
| Staffordshire ... | 35 | 37 | 24 | 65 | 3 | .. |
| Cornwall ...... | 7 | 4 | 16 | 8 | .. | .. |
| Derbyshire .... | 2 | .. | 1 | 13 | .. | .. |
| Durham ...... | 16 | 4 | 1 | 2 | 2 | 6 |
| Northumberland | 3 | 2 | .. | 1 | 2 | .. |
| Shropshire .... | 2 | 8 | .. | 3 | .. | .. |
| Cumberland.... | 30 | 2 | 1 | 1 | 1 | .. |
|  | 162 | 89 | 62 | 141 | 13 | 10 |

I now beg to make extracts from sundry newspapers of the correspondence, from time to time, bearing upon the merits of my invention—the perusal of which, with a diagram of my apparatus, shewing its simplicity and efficiency, together with a scale of the moderate terms for licences now offered for your consideration will, I hope, very much facilitate its immediate adoption, and, for the future, greatly diminish the loss of life occasioned annually by the breakage of ropes or chains, or *the equally fatal accident of being drawn over the pullies.*

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## IMPORTANT TO MINERS.

## PREVENTION OF ACCIDENTS FROM THE BREAKAGE OF ROPES AND CHAINS.

(*From the Staffordshire Advertiser of June* 23.)

When we first introduced Mr Edward Fourdrinier's patent safety apparatus to the notice of our readers, it was with full confidence in the success of the invention, for we had seen it subjected to severe trials with a loaded corfe, and we knew that Mr Fourdrinier had perilled his own safety—if peril there were—by ordering the rope to be cut when he was upon the apparatus, to which alone, therefore, he was indebted for being upheld in mid-air instead of precipitated to the bottom of the pit. With these facts before us, we had no hesitation in directing public attention to the merits of the invention soon after it was patented; and we were more than desirous that the mining interests of our own county should have the credit of being the first to afford encouragement to what promises to be the means of saving many valuable lives. Although we have been disappointed in this wish, we do not think that either the highly-respected patentee or the cause of humanity will suffer from the invention having just received that consideration among the coal-owners and agents in the north which was withheld in Staffordshire. It is well known that the Collieries of the Tyne and Wear are generally worked in the best possible manner;—that there precautions are taken to ensure the safety of the workmen, which are neglected elsewhere, whilst the scientific attainments of most of the "viewers" give their opinion the stamp of authority in matters pertaining to their professional pursuits.

As we have before explained, the object of Mr Fourdrinier's invention is to fix the corfe or cage firmly and instantaneously to guide posts or chains (either suspended or fixed down the pit), by means of self-acting springs, levers, and wedges, attached to the top of the corfe or cage, which come into action when the rope breaks, or otherwise becomes disengaged. A constant source of danger also exists of the drawing of the load over the pullies through the negligence of the engineer,—an accident attended with certain death to the men, as well as great damage to the shaft. This casualty Mr Fourdrinier also entirely prevents by attaching to the chain a disengaging apparatus, such as that made use of in the pile driving machine, the corfe being at the moment of disengagement left affixed to the guides, at a certain distance below the pullies. The invention may, therefore, be said to provide entirely against the breakage of the rope or chain, or the drawing up against or over the pullies, whilst it produces a very economic effect in several particulars.

*To the Editor of the Mining Journal.*

SIR,—Having so frequently experienced your kindness in noticing my invention in your valuable journal, I beg to hand you copies of a correspondence between Mr Elliot and myself, the perusal of which will, I hope, prove satisfactory to you and your numerous readers interested in the welfare of the working miner. Since I brought my invention before the public last year, I have succeeded in simplifying it to my entire satisfaction, and have also obtained the following most desirable advantages:—1. The apparatus is now fixed upon the top and forms part of the cage, which removes the objection of extra weight, and also keeps the wedges freely in action, and always visible when at the top or bottom of the shaft.—2. It is also of great assistance by the action of the springs to the wire rope, by giving them an artificial elasticity, which has long been wanted.

These advantages, and a determination on my part to put the price for licenses upon a scale that shall be within the reach of all mine-owners, will, I hope, ensure its general adoption, and thus secure the miner, at any rate, from one of those fatal accidents to which his hazardous occupation daily subjects him. The cages to which my apparatus are attached at Usworth Colliery are 7 feet 8 inches between the guides, and I am glad that I was so fortunate in the first instance to apply them to a shaft so much larger than those in general use in this and other neighbourhoods.

EDWARD N. FOURDRINIER.

Sunderland, June 12.

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*To George Elliot, Esq., Wearmouth Colliery, Sunderland.*

SIR,—Now that you have had two of my "Patent Safety Apparatuses" at work in your colliery, at Usworth, near Newcastle-upon-Tyne, since the 16th April, I hope you will consider that sufficient time has elapsed since its adoption to warrant you in giving me a report as to its efficiency. I am most anxious for your opinion of the invention, as many parties in this and other neighbourhoods are waiting the result of your trial, before putting it into their pits. I beg to thank you for the opportunity you have afforded me of bringing this patent before the mine owners in a working condition at Usworth.

Yours, &c., EDWARD N. FOURDRINIER.

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Wearmouth Colliery, Sunderland, June 8.

SIR,—In reply to yours of yesterday's date, wherein you ask my opinion of the utility of your "Patent Safety Apparatus," having had it in use for nearly two months, it affords me very great satisfaction to be able to speak so confidently of its merits. I have tested it several times at the Usworth Colliery with a load of 2 tons 8 cwts. upon it, and in every instance it proved successful in always stopping the load within *five inches* from the point it was at when the rope was severed. I have conferred frequently with Mr Burlinson, engineer, of Sunderland, together with our own practical engineers at the different collieries under my management, all of whose opinions fully confirm my own—"That the application of your invention will fully provide against accidents to human life, resulting from the breaking of ropes or chains used for drawing up or lowering men into pits." I may also mention, that the springs have a very perceptible influence upon the wire rope, by diminishing the jerk when the engine is taking the lift and passing the centre. The depth of our Usworth pit is 170 fathoms, and the load raised from the bottom each time is 48 cwts. I have no objection to allow any person you may send to the colliery to see the apparatus, which is at work every day. You may make use of this communication in any way that may be of advantage to yourself in promoting the adoption of your invention, as it is my intention (if I can agree with you as to terms) to apply them to the other collieries under my care.

Yours, &c., GEORGE ELLIOT.

## THE BREAKAGE OF ROPES OR CHAINS.

*To the Editor of the Gateshead Observer.*

SIR,—It has long been a great desideratum in mining to provide against a casuality which is continually happening, viz., the breakage of ropes and chains; for, not only do such occurrences necessarily destroy life, but, in shafts which are fitted up with guides, according to the best modern practice, great damage is occasioned to the shaft fittings. Therefore, in the absence of any expedient to provide against such events, the ropes and chains are necessarily withdrawn as worn out long before they otherwise would be. The object, therefore, of this invention, (a descriptive drawing of which, I find, is preparing for publication,) is to fix the cage and tubs firmly and instantaneously to the guides, by means of self acting springs, levers, and wedges, attached to the top, and forming part of the cage, which come into action when disengaged from the rope or chain.

A constant source of danger, also, prevails in the drawing of the load up against the pullies, by the inadvertance of the engineer, which is also attended with next to certain death, as well as great damage to the property. This casuality Mr Fourdrinier, also, entirely removes, by attaching to the chain a disengaging apparatus, such as is made use of in the pile driving machine, the cage being at the moment of disengagement left affixed to the guides at a certain distance below the pullies. The invention may therefore be said to provide entirely against the breakage of a rope or chain, in the drawing up against or over the pullies; whilst it produces a very economic effect in the following particulars, viz:—With perfect confidence in this invention, the ropes may be worn considerably longer than safety would otherwise warrant, and they are especially benefited by the cage arrangements, inasmuch as the load is lifted in two progressive stages, rather than at present in one abrupt lift, thus doing away with the violent sudden jerk which acts so detrimentally to the machinery. Such is the general description of this invention and its advantages, but as many fancied improvements (especially in mining matters) are discovered after practical experiment to fall short of the utility attached to them by their inventors, a day was appointed, viz., the 14th instant, when numerous viewers and scientific persons were assembled, to witness a trial of the whole apparatus, which has been in current operation since the 16th of April at Usworth Colliery, in the county of Durham, the property of Messrs Jonassohn and Elliot.

The shaft is 10½ feet diameter, and is fitted up with wooden guides, 5 in. by 3 in., and within which a pair of cages are made to work, being 7 feet 8 inches in length between the guides, and each cage containing two tubs, carrying 10 cwt. of coals, so that the weight of the whole moving load may be stated as follows:—

| | |
|---|---|
| Cage, with lifting chains and patent apparatus | 22 cwt. |
| Two tubs | 6 cwt. |
| Coals | 20 cwt. |
| | 48 cwt. |

The experiment, therefore, was made by suddenly disengaging the rope which suspended this immense weight, when the apparatus as instantaneously took effect, and the whole mass was firmly affixed to the guides. The experiment was repeated several times with uniform success; and so entirely satisfactory and self-evident was the whole proceeding, that nineteen viewers and scientific persons present, without hesitation, attached their names to the following certificate, drawn up by one of the spectators on the

**spot; and the success of the trial was hailed with loud cheers by a large body of colliers who had witnessed the proceedings.**

**I am, Sir, yours truly,**
**Matthias Dunn, Colliery Viewer.**

Newcastle-on-Tyne, June 15, 1849.

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## CERTIFICATE.

We, the undersigned, having met for the purpose of witnessing some experiments with an apparatus recently patented by Mr Fourdrinier, for the purpose of arresting the fall of the cage and tubs in case of the breakage of rope or chain, hereby declare our perfect satisfaction with the apparatus, having seen the cage, with two full tubs, weighing in all about 2½ tons, stopped instantaneously upon the disengaging of the rope, and we have no hesitation in stating that it will be highly important, both for the saving of life, and also for preventing damage to the shaft. We therefore certify to the above effect.

MATTHIAS DUNN, Colliery Viewer.
GEORGE ELLIOT, Colliery Owner and Viewer.
GEORGE SOUTHERN, Colliery Viewer.
JOHN TAYLOR RAMSEY, Viewer.
RALPH COULTHARD, Engineer.
SEPTIMUS BOURNE, Viewer.
JAMES CROUDACE, Viewer.
H. T. MORTON, Viewer.
R. H. PHILIPSON, Viewer.
HENRY G. LONGRIDGE, Viewer.
W. REID CLANNY, M.D., F.R.S.E.
LEWIS MORGAN, Clerk, M.A.
W. D. BURLINSON, Engineer.
R. S. NEWALL, P.P. W. SPENCER.
EDWARD A. BOYD, Viewer, Urpeth.
CHRISTOPHER CROUDACE, Viewer.
JOHN ELLIOT, Viewer.
JOHN BELL, Engineer.
THOMAS BUTSON, Engineer.

Usworth Colliery, June 14, 1849.

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Several gentlemen, unable to attend the first exhibition at Usworth Colliery, appointed the 25th June to witness the apparatus in operation, and drew up the following testimonial of their unqualified approbation:—

On the 25th of June, Mr Fourdrinier, at the Usworth Colliery, experimented in our presence with his "Patent Safety Apparatus," and produced invariably by it the most certain and satisfactory results. The tubs, filled with coals, were placed in the cage, weighing altogether about 50 cwt., and when descending in the pit the rope was detached, and by the action of the apparatus the whole was immediately arrested in its descent; but for which it would have been precipitated to the bottom of the shaft, 1000 feet below.

Two of the workmen then placed themselves on the cage, and by a touch of their hands, stopped this weight of 2½ tons, and themselves in addition, instantaneously; and so satisfied were four of the gentlemen present of its efficient nature, that they unhesitatingly committed themselves with upwards of a load of 40 cwt. to its *protecting operations* with the same *successful result.*

**Considering the number and disastrous nature of the accidents from the breaking of ropes and chains, and from being drawn over the pully, against which the "Fourdrinier Apparatus" completely provides, we believe it to be (wherever adopted) a certain and complete security against such accidents.**

**WM. ANDERSON, Viewer.**
**GEO. ELLIOT, Viewer.**
**JAMES MATHER.**
**CHRIS. M. WEBSTER.**
**GEO. W. ARKLEY, Viewer.**
**HENRY R. WEBSTER.**
**C. W. ANDERSON.**

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*To the Editor of the Mining Journal.*

SIR,—On looking at the sketch of Mr Fourdrinier's apparatus for preventing accidents in Mines from the breakage of ropes and chains, it occurred to me to ask what becomes of the detached rope or chain in case of breakage? For instance, if the rope or chain breaks 100 yards above the cage, is the broken portion of the rope suspended in the shaft, or does it fall down upon the cage? If the latter, what security does the invention give to the men, as the rope or chain falling upon them would inevitably be fatal? Perhaps it is intended to make the top of the cage of great strength to resist the blow; but will not the weight of 100 yards of rope or chain falling down that distance be sufficient to carry away cage, guides, and all the apparatus together? I merely write for information, and not from any wish to detract from the merits of the invention.

A NEWCASTLE COLLIER.

16th July.

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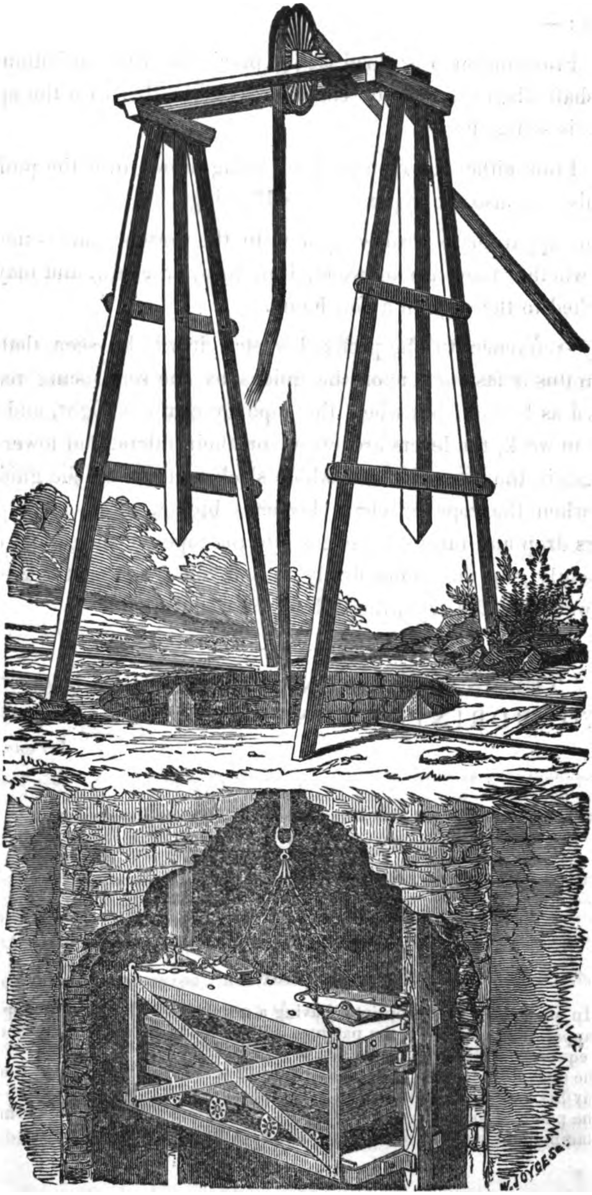
## ACCIDENTS FROM BREAKAGE OF ROPES IN SHAFTS.

In consequence of the remarks of a "Newcastle Collier" in our last number, expressing fears for the lives of the men ascending or descending Pits by Messrs Fourdrinier's safety apparatus from the falling of the heavy chain,—perhaps 100 or more yards—we have been favoured with a communication from George Elliot, Esq., owner of the Usworth Colliery, where the apparatus is at work, in which the following observations occur, a perusal of which will, we think, quiet all fears or doubts on the subject, either of a "Newcastle Collier" or others interested in this important subject:—"On the 5th inst. we had, at our Usworth Collieries, one of the wire ropes broken at the drum, when the engine was taking its lift of the load from the bottom of the pit, at the depth of about 1000 feet; the total length and weight of the rope fell upon the cage and apparatus attached thereto, without the slightest injury to either the cage, appendages, or guides. It is evident, therefore, had men been in the cage, they would have been unhurt. I may observe, that the total length of the rope was about 200 fathoms, and its weight about 37 cwts.; and the way in which I account for its not injuring the cage is, that the fall of the rope is divided over several seconds of time in its descent, and not possessing the acquired momentum of the same weight in a compact or solid body. The cage top was merely covered with a 3-in. Memel plank. I may conclude by observing, with regret, the fearful accident, quoted in the same paper, of seven poor fellows being destroyed in Flintshire, by the breaking of the rope, which, doubtless, would not have terminated fatally had Messrs Fourdrinier's valuable invention been in use there."—*Mining Journal,* Saturday July 28, 1849.

# FOURDRINIER'S PATENT SAFETY APPARATUS

## FOR PREVENTING ACCIDENTS IN MINES AND COLLIERIES.



By the adoption of this invention the lives of the working miners may be preserved, and the property of the mine owners protected from the serious consequences of the following accidents:—

1. From the men or load being precipitated to the bottom of the shaft when the rope or chain breaks; in this case the apparatus is self-acting.

2. From either the men or load being drawn over the pulley; in this case also the apparatus is self-acting.

The apparatus is readily applied to the present guides now in use, whether they are of wood, iron rods, or chain, and may be attached to the cage in a few hours.

By reference to the prefixed sketch it will be seen that the apparatus is fastened upon the guides by the rope being represented as broken, but when the rope or chain is tight, and the cage in work, the levers are raised on their fulcra, and lower the wedges in the tapered shoes, which slackens them on the guides; and when the rope or chain becomes broken or detached, the levers drop and raise the wedges into the tapered shoes, and consequently grip the guides firmly on both sides, so that the greater the weight in the cage, the tighter the wedges hold.

## TERMS FOR LICENCES FOR WORKING "FOURDRINIER'S SAFETY APPARATUS."

| | | | | | *Per annum.* | | |
|---|---|---|---|---|---|---|---|
| | | | | | £ | s. | d. |
| For One Shaft from | 5 to | 40 | Fathoms deep | …… | 5 | 0 | 0 |
| " " | 40 to | 80 | " | …… | 7 | 10 | 0 |
| " " | 80 to | 120 | " | …… | 10 | 0 | 0 |
| " " | 120 to | 160 | " | …… | 12 | 10 | 0 |
| " " | 160 to | 200 | " | …… | 15 | 0 | 0 |
| " " | 200 and upwards | | | …… | 20 | 0 | 0 |

* In such cases as a proprietor having a number of shafts, and applying the apparatus extensively, the patentee will be ready to make a reasonable and equitable abatement on the above terms.

The unexpired term of the patent being 12 years, any proprietor wishing to buy his annuity may do so at 7 years' purchase.

The patentee, or his accredited agents, from time to time to be permitted to examine and see that the apparatus is kept in proper working order.

In addition to the satisfactory working of my apparatus at Usworth, as already detailed, I have now the gratification to state, that I have applied it to the shaft at the Monkwearmouth Colliery (300 fathoms deep, being the deepest in the kingdom), with equal satisfaction to both masters and men, having sustained the enormous weight of 4½ tons in suspension when the rope was detached.

I have the permission of William Bell, Esq. and Partners to invite you to inspect its operation; and as it is so near to the Sunderland Station it can be seen with much less inconvenience to you than at the Usworth Collieries.

The successful results I have now detailed have already secured me orders for the following mines, all of which I hope will be in operation within a month, viz.:—

WM. BELL, ESQ. AND PARTNERS, Monkwearmouth.

N. WOOD AND W. ANDERSON, ESQRS., Harton.

HUGH TAYLOR, ESQ., MATTHEW PLUMMER, ESQ., Proprietors; JOHN TAYLOR, ESQ., Viewer and Manager, Shotton.

D. JONASSHON, ESQ., AND GEORGE ELLIOT, ESQ., South Peareth.

In conclusion, I beg to state that, by the use of this apparatus, not only is the *propietor* provided with the *invaluable power* of protecting the lives of the *numerous workmen* daily in his employ, but his *property* also is equally *protected* when the *rope or chain breaks with a load,* or by the load being *drawn up to the pullies,* by which means the heavy losses occasioned by these accidents *are prevented,* and also by the economy in the use of the ropes by the *elasticity of the springs,* and which form a very heavy amount in Colliery workings.

These advantages, combined with the moderate terms I have named for the use of my invention, will, I hope, be considered no more than equivalent for the benefits conferred both on masters and men.

I have the honour to be,

My Lords and Gentlemen,

Your most obedient servant,

**EDWARD N. FOURDRINIER.**

Sunderland, 20th August, 1849.

N.B. For further information, or to treat for Licenses, application may be made to the Patentee, Mr. E. N. **Fourdrinier**, near Monkwearmouth Colliery, Sunderland; or, Mr. **Joseph Fourdrinier**, 9, College Place, Camden Town, London.